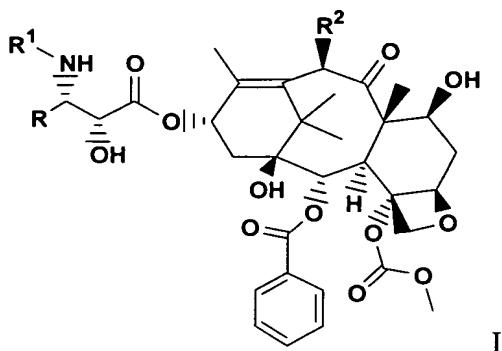


WHAT IS CLAIMED IS:

1. A process for preparing a compound of formula I,



wherein:

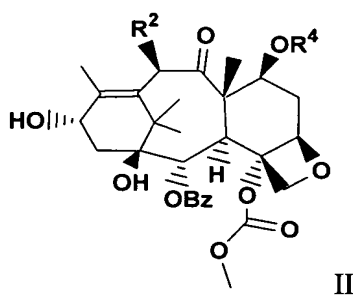
R is phenyl, isopropyl, or tert butyl;

- 10 R^1 is $-C(O)R^Z$ in which R^Z is $(CH_3)_3CO-$, $(CH_3)_3CCH_2-$, $CH_3(CH_2)_3O-$, cyclobutyl-, cyclohexyloxy, or (2-furyl); and

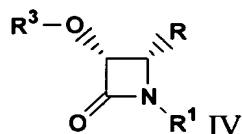
R^2 is $CH_3C(O)O-$,

comprising the steps of:

- (a) reacting a compound of formula II,

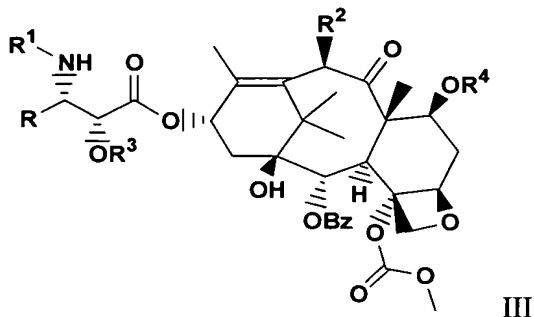


wherein R^2 is as defined hereinabove, and R^4 is a hydroxy protecting group, with a beta-lactam of formula IV,



wherein R¹ and R are as defined hereinabove, and R³ is a hydroxy protecting group,
in presence of a base to produce the compound of formula III,

5



wherein R, R¹, R², R³ and R⁴ are as defined hereinabove; and

(b) deprotecting the hydroxy protecting groups R³ and R⁴ of the compound of
formula III to provide the compound of formula I.

10

2. The process of claim 1, wherein said hydroxy protecting group is selected from
the group consisting of ether, dialkylsilylether, trialkylsilylether,
dialkylalkoxysilylether, ester and carbonate.

15

3. The process of claim 2, wherein:

said ether hydroxy protecting group is methyl, t-butyl, benzyl,
p-methoxybenzyl, p-nitrobenzyl, allyl, trityl, methoxymethyl, methoxyethoxymethyl,
ethoxyethyl, 1-methyl-1-methoxyethyl, tetrahydropyranyl, or tetrahydrothiopyranyl;

20

said dialkylsilylether hydroxy protecting group is dimethylsilyl;

said trialkylsilylether hydroxy protecting group is trimethylsilyl, triethylsilyl,
or t-butyldimethylsilyl;

said dialkylalkoxysilylether hydroxy protecting group is diisopropyl methoxy
silyl;

said ester hydroxy protecting group is benzoyl, acetyl, phenylacetyl, formyl, mono-, di-, or trihaloacetyl; and

said carbonate hydroxy protecting group is methyl, ethyl, 2,2,2-trichloroethyl, allyl, benzyl or p-nitrophenyl.

5

4. The process of claim 1, wherein R^3 is selected from the group consisting of 1-methyl-1-methoxyethyl (MOP), trialkyl silyl and dialkyl alkoxy silyl; and R^4 is selected from the group consisting of dialkyl alkoxy silyl, trialkyl silyl and benzyl carbonate.

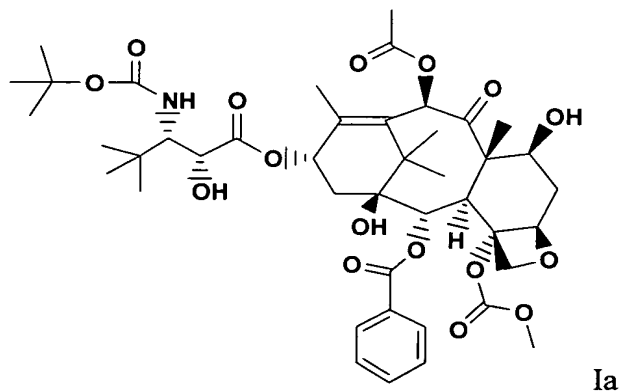
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5. The process of claim 1, wherein R^3 is triethyl silyl or t-butyldimethylsilyl; and R^4 is diisopropyl methoxy silyl.

6. The process of claim 1, wherein said step (b) comprises contacting the compound of formula III with at least one compound selected from the group consisting of a fluoride source and an acid.

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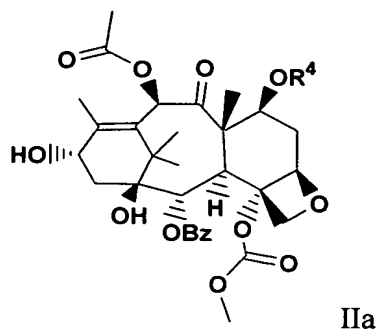
7. A process for preparing a compound of formula Ia,



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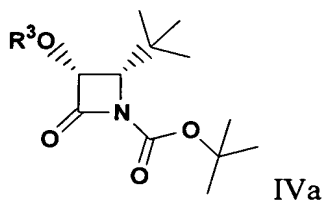
comprising the steps of:

(a) reacting a compound of formula IIa,



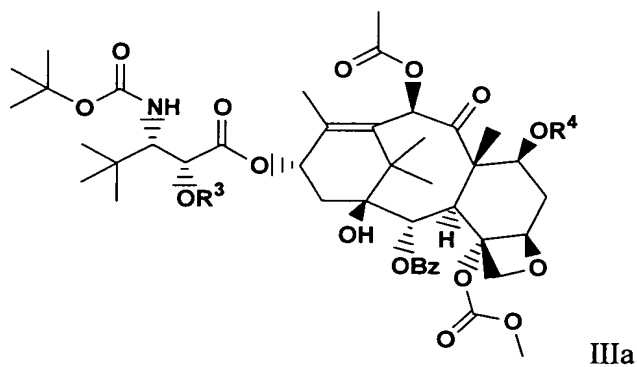
wherein R^4 is a hydroxy protecting group,
with a beta-lactam of formula IVa,

5



wherein R^3 is a hydroxy protecting group,
in the presence of a base to produce a compound of formula IIIa,

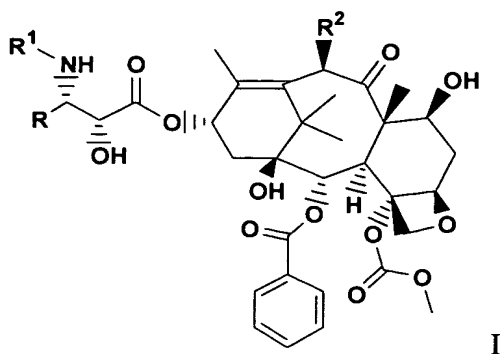
10



wherein R^3 and R^4 are as defined hereinabove; and

(b) deprotecting the hydroxy protecting groups R^3 and R^4 of the compound of
15 formula IIIa to provide a compound of formula Ia.

8. The process of claim 7, wherein said hydroxyl protecting group is selected from the group consisting of ether, dialkylsilylether, trialkylsilylether, dialkylalkoxysilylether, ester and carbonate.
- 5 9. The process of claim 8, wherein:
said ether hydroxyl protecting group is methyl, t-butyl, benzyl, p-methoxybenzyl, p-nitrobenzyl, allyl, trityl, methoxymethyl, methoxyethoxymethyl, ethoxyethyl, 1-methyl-1-methoxyethyl, tetrahydropyranyl, or tetrahydrothiopyranyl;
said dialkylsilylether hydroxyl protecting group is dimethylsilyl;
10 said trialkylsilylether hydroxyl protecting group is trimethylsilyl, triethylsilyl, or t-butyl dimethylsilyl;
said dialkylalkoxysilylether hydroxyl protecting group is diisopropyl methoxy silyl;
said ester hydroxyl protecting group is benzoyl, acetyl, phenylacetyl, formyl,
15 mono-, di-, or trihaloacetyl; and
said carbonate hydroxyl protecting group is methyl, ethyl, 2,2,2-trichloroethyl, allyl, benzyl or p-nitrophenyl.
- 10 10. The process of claim 7, wherein R^3 is selected from the group consisting of 1-methyl-1-methoxyethyl (MOP), trialkyl silyl and dialkyl alkoxy silyl; and R^4 is selected from the group consisting of dialkyl alkoxy silyl, trialkyl silyl and benzyl carbonate.
- 25 11. The process of claim 7, wherein R^3 is triethyl silyl or t-butyl dimethylsilyl; and R^4 is diisopropyl methoxy silyl.
12. The process of claim 7, wherein said step (b) comprises contacting the compound of formula III with at least one reagent selected from the group consisting of a fluoride source and an acid.
- 30 13. A process for preparing a compound of formula I,



wherein:

R is phenyl, isopropyl, or tert butyl;

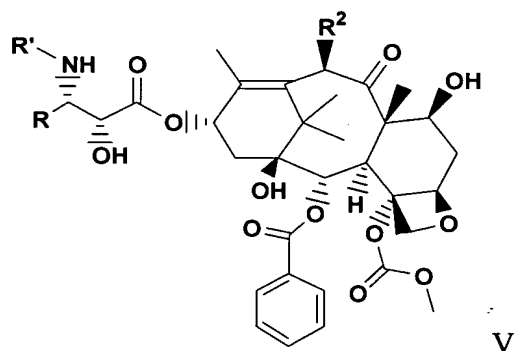
5 R^1 is $-C(O)R^Z$ in which R^Z is $(CH_3)_3CO-$, $(CH_3)_3CCH_2-$, $CH_3(CH_2)_3O-$,
cyclobutyl-, cyclohexyloxy, or (2-furyl); and

R^2 is $CH_3C(O)O-$,

comprising the steps of:

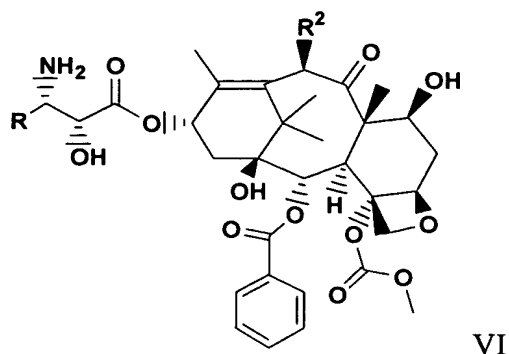
(a) deprotecting a compound of formula V,

10



wherein R and R^2 are as defined hereinabove, and R' is an amine protecting group,
to produce a compound of formula VI,

15



wherein R and R² are as defined hereinabove; and

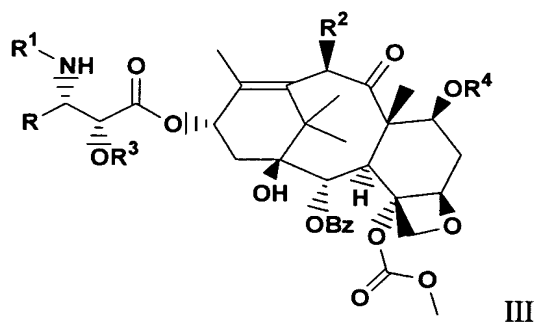
- (c) attaching R¹ to the NH₂ group of the compound of VI by reacting the
5 compound of formula VI with a compound containing R¹.

14. The process of claim 13, wherein said compound containing R¹ is selected from the group consisting of acid chloride, chloroformate and acid anhydride.

- 10 15. The process of claim 14, wherein R' is BOC or CBZ.

16. The process of claim 15, wherein R is tert butyl, and R¹ is -C(O)R^z in which R^z is (CH₃)₃CO-.

- 15 17. A compound of formula III,



wherein:

- 20 R is phenyl, isopropyl, or tert butyl;

R^1 is $-C(O)R^Z$ in which R^Z is $(CH_3)_3CO-$, $(CH_3)_3CCH_2-$, $CH_3(CH_2)_3O-$, cyclobutyl-, cyclohexyloxy, or (2-furyl);

R^2 is $CH_3C(O)O-$; and

R^3 and R^4 are each independently a hydroxy protecting group.

5

18. The compound of claim 17, wherein said hydroxy protecting group is selected from the group consisting of ether, dialkylsilylether, trialkylsilylether, dialkylalkoxysilylether, ester and carbonate.

10 19. The compound of claim 18, wherein:

said ether hydroxy protecting group is methyl, t-butyl, benzyl, p-methoxybenzyl, p-nitrobenzyl, allyl, trityl, methoxymethyl, methoxyethoxymethyl, ethoxyethyl, 1-methyl-1-methoxyethyl, tetrahydropyranyl, or tetrahydrothiopyranyl;

said dialkylsilylether hydroxy protecting group is dimethylsilyl;

15 said trialkylsilylether hydroxy protecting group is trimethylsilyl, triethylsilyl, or t-butyldimethylsilyl;

said dialkylalkoxysilylether hydroxy protecting group is diisopropyl methoxy silyl;

20 said ester hydroxy protecting group is benzoyl, acetyl, phenylacetyl, formyl, mono-, di-, or trihaloacetyl; and

said carbonate hydroxy protecting group is methyl, ethyl, 2,2,2-trichloroethyl, allyl, benzyl or p-nitrophenyl.

20. The compound of claim 17, wherein R^3 is selected from the group consisting of 1-methyl-1-methoxyethyl (MOP), trialkyl silyl and dialkyl alkoxy silyl; and R^4 is selected from the group consisting of dialkyl alkoxy silyl, trialkyl silyl and benzyl carbonate.

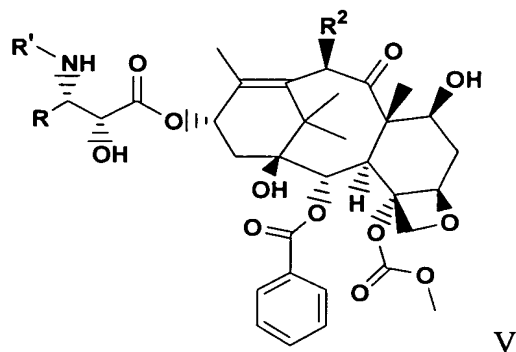
21. The compound of claim 17, wherein R^3 is triethyl silyl or t-butyldimethylsilyl; and R^4 is diisopropyl methoxy silyl.

30

22. The compound of claim 21, wherein R is tert butyl; and R¹ is -C(O)R² in which R² is (CH₃)₃CO-.

23. A compound of formula V,

5



wherein:

R is phenyl, isopropyl, or tert butyl;

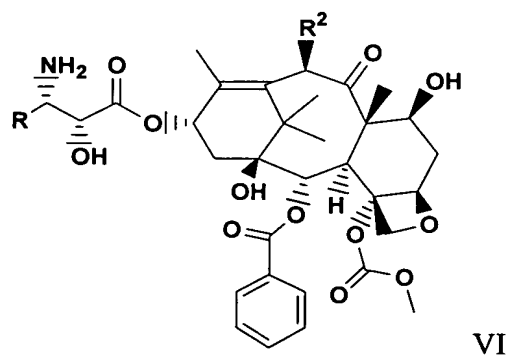
10 R' is an amine protecting group; and

R² is CH₃C(O)O-.

24. The compound of claim 23, wherein R is tert butyl.

15 25. The compound of claim 24, wherein R' is BOC or CBZ.

26. A compound of formula VI, or a pharmaceutically acceptable salt thereof,



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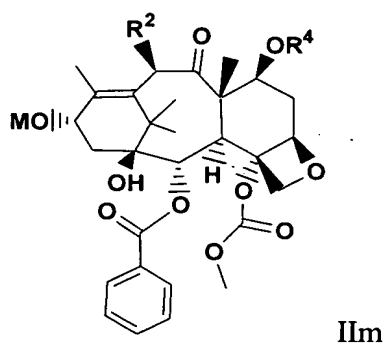
wherein:

R is phenyl, isopropyl, or tert butyl; and

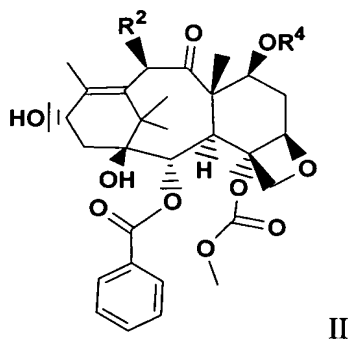
R^2 is $\text{CH}_3\text{C}(\text{O})\text{O}-$.

27. The compound of claim 26, wherein R is tert butyl.

28. A process for the preparation of a metal alkoxide of formula II_m,



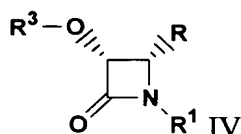
wherein R^2 is $\text{CH}_3\text{C}(\text{O})\text{O}-$, R^4 is a hydroxy protecting group, and M is a metal atom (ion),
comprising reacting a compound of formula II,



wherein R^2 and R^4 are as defined hereinabove,
with a metal base.

29. The process of claim 28, wherein said metal base is selected from the group consisting of lithium diisopropylamide, C₁₋₆ alkyl lithium, lithium bis(trimethylsilyl)amide, sodium bis(trimethylsilyl)amide, potassium bis(trimethylsilyl)amide, phenyllithium, sodium hydride, potassium hydride and lithium hydride.
30. The process of claim 28, further comprising reacting said metal alkoxide of formula II_m with a beta-lactam of formula IV,

10



wherein:

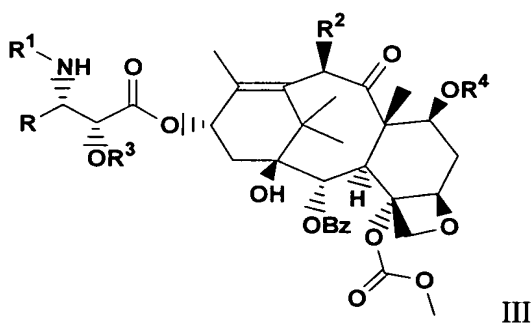
R is phenyl, isopropyl, or tert butyl;

R¹ is -C(O)R² in which R² is (CH₃)₃CO-, (CH₃)₃CCH₂-, CH₃(CH₂)₃O-,

15 cyclobutyl-, cyclohexyloxy, or (2-furyl); and

R³ is a hydroxyl protecting group,

to produce a compound of formula III,



20

wherein R, R¹ and R³ are as defined hereinabove; R² and R⁴ are as defined in claim 28.